

Objective: Students will **derive** & **apply** double - angle formulas

**Establishing a
DOUBLE-ANGLE
formula for **sine**:**

Establish: $\sin 2\theta = 2\sin\theta\cos\theta$

$\sin 2\theta = \sin(\theta + \theta)$

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**Establishing a
DOUBLE-ANGLE
formula for **cosine**:**

Establish: $\cos 2\theta = \cos^2\theta - \sin^2\theta$

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**Establishing a
DOUBLE-ANGLE
formula for **cosine**:**

Establish: $\cos 2\theta = 1 - 2\sin^2\theta$

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**Establishing a
DOUBLE-ANGLE
formula for **cosine**:**

Establish: $\cos 2\theta = 2\cos^2\theta - 1$

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DOUBLE-ANGLE formulas:

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\cos 2\alpha = 1 - 2\sin^2 \alpha$$

$$\cos 2\alpha = 2\cos^2 \alpha - 1$$

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DOUBLE-ANGLE formulas:

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$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\cos 2\alpha = 1 - 2\sin^2 \alpha$$

$$\cos 2\alpha = 2\cos^2 \alpha - 1$$

Given: $\sin \theta = \frac{-1}{\sqrt{3}}$ and $\frac{3\pi}{2} < \theta < 2\pi$

Find the exact value of $\sin 2\theta$

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DOUBLE-ANGLE formulas:

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\cos 2\alpha = 1 - 2\sin^2 \alpha$$

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Establishing a DOUBLE-ANGLE formula for tangent:

Use the sum formula for tangent
 $\tan(\alpha + \beta)$
to develop a formula for $\tan 2\theta$.

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Other variations:

Use the double angle formulas to
find variations of the following:

$$\sin^2 \theta$$

$$\cos^2 \theta$$

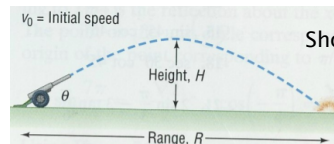
$$\tan^2 \theta$$

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Projectile Motion

An object is propelled upward at an angle θ to the horizontal with an initial velocity of V_0 feet per second. If air resistance is ignored, the horizontal distance R it travels, the range, is given by:

$$R = \frac{1}{16} V_0^2 \sin \theta \cos \theta$$



Show that

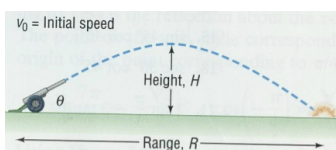
$$R = \frac{1}{32} V_0^2 \sin 2\theta$$

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Projectile Motion

An object is propelled upward at an angle θ to the horizontal with an initial velocity of V_0 feet per second. If air resistance is ignored, the horizontal distance R it travels, the range, is given by:

$$R = \frac{1}{16} V_0^2 \sin \theta \cos \theta$$



Find the angle θ
for which
 R is a maximum.

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Homework

Page 498-500

(1 - 9 every other odd, *parts a and b only*
31, 35, 75)